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# PROXIMATE AND SENSORY EVALUATION OF PEANUT CAKES FORTIFIED WITH MORINGA OLEIFERA LEAF POWDER

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**Abstract.** The high-calorie ingredients used in the production of cakes has made older age group to desist from eating cakes because of the detrimental effects in the human body. A substitution approach using moringa leaf powder in peanut cake to address this effect was utilized. The moringa leaf powder was added in succession of 0, 2, 4, 6, 8 and 10 w/w% to fortify peanut cakes. Standard methods were used to assess the proximate analysis and sensory evaluation of the blends. The proximate analysis showed an increased protein (13.83 - 16.68%), fat (0.86 - 4.55%) and crude fibre (1.24 - 2.23%) contents with increased addition of moringa leaf powder; while there was an observed decrease in the carbohydrate content. Among the fortified samples, the cake blend with 2% moringa leaf powder addition was the most preferred in its quality index of taste, touch, mouthfeel, look and colour. In conclusion, based on the analyzed nutritional indices, fortification of cakes with moringa leaf powder will enhance protein and crude fibre contents as it brings down the carbohydrate content in cakes.

**Keywords:**Fortification; Cakes; Proximate composition; Moringaoleifera leaf; Nutritional indices.

## 1.Introduction

Cakes are sumptuous baked product that have special soft texture and fine organoleptic properties. Flour, sugar, butter and eggs are some of the ingredients used in baking cake. They generally help in texture enhancement and shelf life improvement but emulsifier, sorbitol, invert, glucose, baking powder e.t.c are some additives that can also be added during the cake mixing [11, 13, 19]. According to [13, 17, 9], cakes can be classified into sponge cakes, whole cakes and oil cakes. The fortification of cakes with highly nutritious and healthier food



components play cogent roles in decreasing the threats connected to the consumption of sugar and fat, as obesity can arise from the frequent consumption of cakes due to the high fat and sugar content obtained from its ingredients that provide high calorie and energy level [20, 5]. One flexible, economical and socially acceptable way to improving the intake of nutrients of groups at risk of obesity is fortification. This will provide an alternative means for people's access to processed or milled food thereby ensuring nutritional adequacy [8].

Several researchers have studied food fortified by *Moringa Oleifera* in various parts of the world such as African soups, amala, biscuits, bread, yoghurt and cheese [18, 16]. *Moringa oleifera* which belongs to the family Moringaceae was discovered in the sub-Himalayan areas of Afghanistan, Pakistan and India. It serves as a rich source of nutrients because of the essential phytochemicals such as tannins, flavonoids, sterols, anthraquinones, terpenoids, saponins and reducing sugar, contained in its pods, seeds and leaves [12]. Adding *Moringa oleifera* leaf powder to cakes will ultimately serve as a conveyor of micronutrients into the diet of major cake consumers, although, despite the broad application of *Moringa oleifera* in food fortification there are limited studies of its addition in cake baking [10]. The augmentation of the nutritive profile of peanut butter cakes with moringa leaf powder was studied in this present work.

## **2. Materials and methods**

### *2.1 Materials*

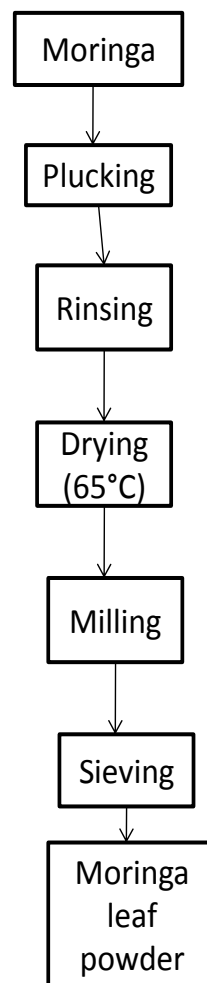
#### *2.1.1 Samples*

Baking constituents such as eggs, sugar, flour, baking powder, and peanut butter (Trio creamy peanut butter) were purchased at Justrite Supermarket, Ota. The moringa leaves were obtained from a *Moringa* tree in Ramoth Extension, Canaanland, Ota, Ogun State, Nigeria.

### *2.2 Methods*

#### *2.2.1 Processing Moringa Leaves to Powder*

Matured moringa leaves were handpicked from the tree, rinsed (cleaned), and dried using a cabinet drier at 40°C. The dried leaves were ground in a Rite Tek blender (BL- 210). The moringa leaf powder was sift using a sieve of 500 mm mesh size to achieve a very fine powder, which was later packed in a cellophane bag until when needed (Figure 1).



**Figure 1:** Flow chart showing moringa leaf powder production.

### 2.2.2 Preparation of Moringa Fortified Peanut Butter Cake

The modified method of [10] was used in preparing the moringa peanut cake samples. 75 g of flour was weighed and put aside in a bowl. 50 g of peanut butter and 25 g of sugar were also weighed and thoroughly mixed in an electric mixing machine for 20 mins in order to attain a fluffy consistency. The baking powder and eggs were added to the mixture while the flour was also added gradually until a paste was formed. This was done for all the samples with increasing addition of moringa powder (0, 2, 4, 6, 8, 10) in grammes. The electric oven was preheated to 180 °C and samples were baked for a period of 30 minutes. The baked samples were removed from the oven, pan and were allowed to cool at room temperature for 2 hours.

## 2.3 Chemical Analysis of the cake samples

All the chemicals and reagents used in this research work were of analytical grade and gotten from Aldrich. Ash, ash content, crude fibre, moisture, total nitrogen (kjeldahl method) and fat analysis were determined using [4] method. The total nitrogen obtained was changed to protein by the multiplication of the values gotten with a factor of 6.25. CHO content was obtained by the subtraction of % Ash + % Fibre + % Fat + % Protein + % Moisture from 100. A Unican model pH meter that had been homogenized earlier with buffer solutions of pH 4 and 9 was used in measuring the pH samples and using the method proposed by [15]. Sensory evaluation was judged by trained experts with the use of a 6-point Hedonic index of colour, taste, mouthfeel, texture, acceptability and appearance.

## 3. Data Analysis

The SPSS version 20 and Microsoft Excel were used to record the data of this study. Continuous data were reported as mean  $\pm$  standard error of the mean while percentages were used in recording proportions. The mean values between and within the groups were compared via the Analysis of variance (ANOVA). Statistical significance was indicated at a P value  $<0.05$

## 4. Results and Discussions

### 4.1 Effect of Moringa Leaf Powder on the Proximate Properties of Cakes

The proximate analyses of the samples including the control (Sample A) are presented in Table 2. Moisture is the quantity of water existent in the food samples which determines the life span and degree of deterioration of the food samples. It also affects the blending, mixing and packaging of the food samples [2]. The moisture content of the cake samples ranged between (1.56 % - 1.31 %). It was observed that the control has the highest moisture content (1.56 %) while sample E has the lowest (1.31 %). This result differs from the reports of [9] and [1] on the fortification of cake and maize-*ogi* using moringa leaf powder respectively in which the moisture content of the wheat flour moringa samples increased as the quantity of moringa also increased. [6] worked on moringa seed powder fortified breads which showed a similar trend with the outcome of this report as the quantity of moringa leaf powder also increased. This present study has showed that enrichment of peanut cakes with moringa leaf powder (MLP) decreases the moisture content hereby increasing the shelf life of the cake samples.

Proteins are large molecule which consists of one or more elongated chains of amino acids. The protein content ranges from 13.83% - 16.68% as the quantity of MLP increased. The control had the lowest protein content and sample F which contained the highest content of MLP had the highest protein content. Several researchers also recorded an increase in protein content when their primary foods were fortified with MLP [10, 1, 21 and 14] reported approximated values of (28%) and (30%) for protein content in moringa leaves. Cakes are made from flour which is highly rich in carbohydrates and low in protein, but a healthier snack will be achieved with the inclusion of moringa leaf powder in cake ingredients due to its protein content. The addition of moringa leaf powder to cakes will increase its protein content thereby making the snack highly nutritious.

Increased ash content values were obtained with increased level of addition of MLP. Sample C (6% MLP) had the highest ash content (2.70 %) which shows it has the highest mineral content accessible to augment the food while the control has the lowest ash content (1.29 %). The high ash content observed is a good indication that moringa leaf powder is rich in minerals. Fats are one of the major constituents of food, a good source of fatty acids and are important in our diets. Fats are also solids at room temperature, hydrophobic but dissolve in organic solvents. When fats get into the body system, it is often broken down in the body by enzymes such as lipases which are produced in the pancreas. Fats help the body in the maintenance of the skin and hair, serves as a good buffer against a lot of diseases, serves as a good shock absorber, helps to maintain the body temperature and generally promote healthy cell functions. However, over-consumption of fats can lead to some adverse health issues like high cholesterol level and obesity. The addition of moringa leaf powder to peanut butter slightly increased the fat content of the fortified samples (0.8 - 4.55 %).

**Table 1.** Batch composition for the fortification process

<b>Ingredients</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
Wheat flour (g)	75	73	71	69	67	65
Moringa leaf flour (g)	0	2	4	6	8	10
Peanut Butter (g)	50	50	50	50	50	50
Egg	1	1	1	1	1	1
Sugar (g)	25	25	25	25	25	25
Baking powder (tbs)	½	½	½	½	½	½

**Table 2.** Proximate analysis of peanut butter cakes fortified with moringa leaves powder

<b>Sample</b>	<b>Moisture (%)</b>	<b>Ash (%)</b>	<b>Fat (%)</b>	<b>Protein (%)</b>	<b>Crude Fibre (%)</b>	<b>Carbohydrate (%)</b>
A	1.56 ± 0.02	1.29 ± 0.01	0.86 ± 0.03	13.83 ± 1.22	1.24 ± 0.78	81.22 ± 2.44
B	1.41 ± 0.24	1.90 ± 0.05	1.68 ± 0.04	14.70 ± 1.76	1.78 ± 0.35	78.53 ± 1.98
C	1.43 ± 0.09	2.70 ± 0.04	3.02 ± 0.06	15.23 ± 1.38	1.80 ± 0.38	75.82 ± 2.65
D	1.41 ± 0.59	1.79 ± 0.07	3.81 ± 0.22	15.93 ± 1.29	2.20 ± 0.19	74.86 ± 2.41
E	1.31 ± 0.66	2.69 ± 0.35	4.01 ± 0.15	16.28 ± 1.33	2.23 ± 0.16	73.20 ± 1.89
F	1.43 ± 0.04	1.59 ± 0.08	4.55 ± 0.27	16.68 ± 1.35	2.23 ± 0.22	73.06 ± 1.67

**Table 3:** Mean sensory analysis of peanut butter moringa fortified cakes

Sample	Colour	Taste	Texture	Mouth feel	Appearance	Overall Acceptability
A	2.1 <sup>b</sup>	5.2 <sup>a</sup>	5.0 <sup>d</sup>	1.0 <sup>a</sup>	3.2 <sup>b</sup>	2.1 <sup>b</sup>
B	3.2 <sup>a</sup>	5.0 <sup>c</sup>	5.0 <sup>a</sup>	1.0 <sup>b</sup>	3.1 <sup>d</sup>	2.1 <sup>d</sup>
C	4.1 <sup>a</sup>	5.0 <sup>c</sup>	5.3 <sup>c</sup>	1.1 <sup>b</sup>	3.0 <sup>ac</sup>	1.5 <sup>e</sup>
D	4.0 <sup>c</sup>	5.4 <sup>bc</sup>	4.1 <sup>a</sup>	1.2 <sup>b</sup>	1.2 <sup>c</sup>	1.2 <sup>b</sup>
E	5.0 <sup>b</sup>	5.3 <sup>b</sup>	2.1 <sup>b</sup>	1.0 <sup>c</sup>	1.1 <sup>c</sup>	1.4 <sup>a</sup>
F	5.2 <sup>b</sup>	5.2 <sup>c</sup>	2.5 <sup>b</sup>	1.5 <sup>c</sup>	1.3 <sup>b</sup>	1.1 <sup>a</sup>

Note: Each sample analysis was done in triplicates and the mean value obtained and reported.

The part of the total carbohydrate which is resistant to acid or alkali treatment is referred to as the crude fibre. There was a slight increase in the crude fibre content of the fortified samples as compared to the control and this is a good indication that moringa is rich in crude fibre which helps to decrease the cholesterol level in the blood [3]. Studies have shown that an increase in the dietary fibre content of foods can reduce the risk of certain type of cancers [7]. There was an inverse relationship in the CHO and protein content of the samples. Carbohydrate content decreased as the fortification with moringa increased.

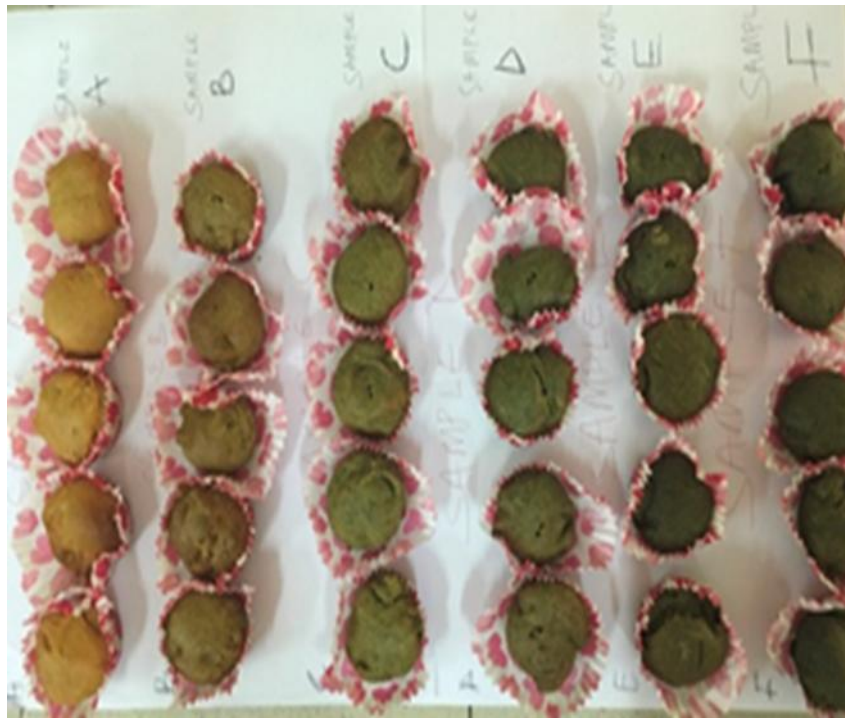
#### 4.2 Sensory Evaluation

Table 3 shows the sensory attribute scores of the peanut cakes fortified with moringa leaves powder. a ten-men trained sensory evaluation panelist judged the samples. There was no significant difference observed in the taste and mouth feel but there was a difference in the color, texture, appearance and general acceptability of the cakes. Highest acceptability was recorded on the control and this may be due to the judges' familiarity with cakes generally (Figure 2). Sample B (2% MLP) had the highest acceptability among the fortified samples apart from the control.

The addition of moringa leaf powder to the cakes changed the color of the cake brown whitish brown to green and thereby lowering the acceptability as the addition of MLP was increased. Fortified cakes beyond 2% moringa leaf powder addition exhibited lowest acceptability.

### 5. Conclusions

This research has showed that a good and nourishing cake can be made from peanut butter cake fortified with moringa leaves. However, the green colour and taste of moringa at a higher addition of the MLP affected the organoleptic assessment by the panelist despite the fact they had higher values for protein and crude fibre. It is also confirmed that peanut butter cakes fortified with moringa leaf powder results in observable rise in protein content of the cake, which will be of pronounced dietary benefits especially in nations that are just developing, where the cost and accessibility to high protein foods is high.



**Figure 2:** Picture peanut butter moringa fortified cakes

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